Land, Agricultural and Energy Barriers – Opportunities to Increase Production in the East

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Books on My Shelf

Collapse (Jerrod Diamond)
Abundance (Diamandis & Kolter)
Food Security in the US

- Migration of Agriculture within the US is an alternative to importing food
- In 2015, nearly 1 million acres in CA were fallow, costing $2.7 billion to the economy and 18k jobs lost
- CA farmers are moving to Mexico
- Western Grower’s survey (2014) found that 27 members had over 110,000 acres of vegetable production in Mexico employing 23,500 workers
- Reason? Labor, water and regulations!
- 75% of US consumed tomato’s originate in Mexico

Source: http://www.capitalpress.com/Nation_World/Nation/20150618/some-worry-as-more-production-moves-outside-us
In 1850, eastern agriculture was very diverse
Every farmer has a garden
Midwest and west was unsettled
Water and rail transportations systems being developed
Southern and Eastern Resources

Food Energy Water Nexus

• Should food production migrate to the east?
• Is there sufficient land to increase production?
• How do we better utilize eastern timber resources for energy?
• What are the opportunities and barriers?
• What policies need to be developed?
Characteristics of East and Southeast

**Food**
- Large poultry industry
- Concentration of hogs in NC
- Ship cattle to Midwest feedlots
- Corn and soybean deficit states
- Limited adoption of irrigation
- Wide variety of crops

**Energy**
- Established timber industry
- Oil Refinery infrastructure
- Close to population centers

**Water**
- Sufficient precipitation
- Distribution not uniform or predictable
- Influenced by El Nino and La Nina
- Large rainfall events creating high runoff
- Limited surface water storage
Average Annual Precipitation – Potential Evapotranspiration
Farmland Characteristics

- 2.3 Billion acres in US
- 18% is cropland
- 40%-50% of US farmland is rented \(^1\)
- Financial firms (REITS) own 1% of farmland, trend is increasing
- Within 20 years, 400 m acres will be up for sale

\(^1\)Source: Mother Jones, March 14, 2014
2015 Cropland Value by State
Dollars per Acre and Percent Change from 2014

Legend

<table>
<thead>
<tr>
<th>Range</th>
<th>U.S. 4,130</th>
<th>997 - 1,620 $/acre</th>
<th>1,621 - 2,210 $/acre</th>
<th>2,211 - 2,850 $/acre</th>
<th>2,851 - 4,100 $/acre</th>
<th>4,101 - 5,900 $/acre</th>
<th>5,901 - 8,320 $/acre</th>
<th>8,321 - 13,500 $/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>4,130</td>
<td>+0.7%</td>
<td>+1.2%</td>
<td>+3.8%</td>
<td>+5.0%</td>
<td>+5.9%</td>
<td>+8.0%</td>
<td>+9.5%</td>
</tr>
</tbody>
</table>

Source: http://www.nass.usda.gov/Charts_and_Maps/Land_Values_and_Cash_Rents/crop_value_map.asp
Average Cash Rent for Farmland in 2014

Rent in the SE-US is ½ that of the Midwest and California

Source: http://quickstats.nass.usda.gov/data/maps/7878272B-A9F3-3BC2-960D-5F03B7DF4826
Amount of Prime Farmland Recovered From Timber (1.8 m ac)

Net Change in Acreage of Prime Farmland used as Forest Land, 1982-1997

- Total increase: 3,323,200 acres
- Total decrease: 1,424,900 acres
- Total net increase: 1,898,300 acres

Each red dot represents a 2,000-acre decrease.
Each green dot represents a 2,000-acre increase.

Map ID: m005
Data Sources: 1987 National Resources Inventory
Revised: December 2000
Timing of Water Can Be Limiting

- SE-US is primarily non-irrigated
- Rainfall is high, but not uniformly distributed
- April 29, 2014, 24” rainfall event on gulf coast
- Alabama runoff averages 29” each year
- 15% of all US surface water flows through Alabama
• 17% (55 million ac) of cropland was irrigated in 2012
• Irrigated farms accounted for 50% of crop sales
• Many farmers in the east are not using irrigation even though there is sufficient water
Change in irrigated acreage, 2007-12

U.S. net decrease = -777,074 acres

Irrigation is Needed

- Irrigation is needed for farmers in the SE-US to be competitive for some crops
- Irrigation is slowly being adopted in the SE-US
- Irrigated yields are competitive
  - Corn: 200-250 bu/ac
  - Soybean: 60-75 bu/ac
  - Peanuts: 5000-7000 lb/ac
  - Cotton: 2000-2500 lb/ac

- Policies needed to develop surface water systems
Barriers to Irrigation

- High level of rented land
- Non-operating owners own 77% of rented land\(^1\)
- Landowners may not fund improvements
- Low aversion to risk
- Older farmers close to retirement
- Non-developed surface water storage
- Some urban/agricultural water competition emerging
- Low skill level of farm labor
- No policies to support transition
- Difficulty in constructing surface ponds (EPA)

Opportunities for Feed Grain Expansion

Poultry Production in the US

#1 – Georgia
#2 – Alabama
#3 – Arkansas

Source: USDA, National Agricultural Statistics Service.
2007 Estimated Corn Production-Consumption Surplus/Deficit for Animal Feed Utilization and Corn Export Ports

Alabama Poultry Feed Deficit for 1 Billion Broilers

Corn Produced: 30 million bu
Corn Used: 150 million bu
**Deficit:** 120 million bu

Soybeans Produced: 8.7 million bu
Soybeans Used: 68 million bu
**Deficit:** 60 million bu

**800K acres needed**

**1 M acres needed**

*Bringing prime farmland back into production to overcome this deficit could have a direct economic impact of $1.5 billion, indirect impact of $5 billion, and create 18,000 jobs!*
Barriers to Expanding Feed Grain Crops

• Land would come from timber or pasture
• Timber land requires $1000/ac to clear for crops
• Irrigation needed
• Capital requirements for row crop farms to expand
  • Farmer age
  • Risk aversion
  • Young farmers do not have credit
• Grain handling infrastructure

In Alabama, if we add 1.8 M acres to existing 2.4 M ac of row crops, we would need more farmers
Opportunities for Vegetable and Fruit Expansion

Success is dependent on varieties, knowledge, labor, infrastructure, markets
US Vegetable Production

36% East
53% West
11% Scattered
US Fruit Production

U.S. fruit: Top producing States, based on 2010 bearing acreage


27% East
65% West
8% Scattered
Barriers to Fruit & Vegetable Production

- Creditors are not familiar with the crop
- Diseases due to high humidity
- Rainfall interrupts harvest (hurricanes)
- Must develop in clusters for infrastructure
- Lack of farmer knowledge
- Farmer mindset and culture
- Single or double season (CA grows year-round)
- Labor force
- Few variety development programs
- Research and Extension programs
- Professor turnover rate of 30-40 yrs
Opportunities for Bioenergy

World Oil Demand 1990-2025

- All Others
- South & S.E. Asia
- Japan/ANZ
- Middle East / Africa
- China
- U.S. / Canada / Western Europe

China and India

Source: PIRA
Renewable Fuel Standard

EISA’s Renewable Fuel Standard

Billion Gallons/Year

2005: 7.5B x 2012

2012

2022

Other Biofuels
BioDiesel
Cellulosic Biofuels
Corn Ethanol

21B

15B

Green Car Congress

Source: National Report on Forest Resources and Other Historic Data

Source: National Report on Forest Resources
Growing Stock Harvested by Major Owner, Region and Year

Source: National Report on Forest Resources
Timber Ownership in the US

- 250 million ha in 48 states (stable over last 100 years)
- 160 million ha privately owned (2/3)
- Number of small holdings increasing
- Large increase in number of owners, decrease in size of holding
- Forest fragmentation is becoming a problem

Alabama
- 23 million ac of timber land (22m ac corn and soybeans in Iowa)
- 71% of total area
- 94% of forestland is privately owned
- 432,000 land owners
- Large number of small landholders (<50 ac) (88%)
- Small number of large landholders
- Small landholdings often used for recreation rather than timber production
Renewable Energy from Timber

• Cellulosic Ethanol (efficiencies increasing)
• Gasification (improvements in catalysts)
• Pyrolysis (up to 100 gal/ton)
• Studies on short rotation bioenergy crops
Location and Number of Ethanol and Cellulosic Ethanol Plants in the US

Source: http://www.ethanolproducer.com/plants/map/
Private Timberland!
Opportunities/Barriers

Opportunities
• Significant timber and infrastructure
• Private land used for recreation
• Conversion technology is improving
• Large company investments (DuPont, Syngenta)
• Renewable hydrocarbons produced near refinery infrastructure

Barriers
• Federal funding is decreasing in this area
• Venture capital has ceased
• Large public/private ventures have failed
• Higher valued crops could be grown on best timber land
In 1991, the Andean Trade Preference Act directed the federal government to help establish asparagus farms in Peru in hopes of weaning growers away from producing cocoa leaves for cocaine. The effort resulted in Peruvian growers producing both crops and wiped out Washington state’s 55 million-pound-a-year canned asparagus industry.

Source: http://www.capitalpress.com/Nation_World/Nation/20150618/some-worry-as-more-production-moves-outside-us
Conclusions

- Current national agricultural system is challenged
- East/SE has potential to diversify
- Research is needed to develop policies to diversify US Agriculture
- How to best utilize land resources?
- How to match land with need for FEW nexus
- Value of recreational land vs other uses
Value of Timber

Alabama Sawtimber Stumpage Prices
quarterly averages, $ per ton

Chip-n-saw
Pine Sawtimber
Hdwd Sawtimber

Alabama Pulpwood Stumpage Prices
quarterly averages, $ per ton

Hdwd Pulpwood
Pine Pulpwood
Average Return of Timber

Average site
Age 15 thinning $16/ac/yr
Age 22 thinning $13/ac/yr
Age 35 Cut $92/ac/yr
Total: $107/ac/yr

This a good return for absentee landowner but land could be better utilized
Introduction

• Desert Lands Act of 1877 designed to encourage development of small farms in desert west

• Reclamation Act of 1902 initiated development of large scale water projects

• Many projects to build dams and canals were initiated over the subsequent years
  • Hoover Dam on Colorado River (1935)
  • Coulee Dam on Columbia River (1942)
  • Shasta Dam in Central Valley (1945)

• Subsidized water brought farms to the dry west

• Urbanization is creating conflicting use for that water
Introduction

• Subsidized water brought farms to the dry west

• Long growing seasons created competitive advantage, especially for vegetable and nut production

• By the 1960’s non-irrigated farms in the southeast could no longer compete with the midwest and west

• Much crop land has been converted to timber to support the paper and construction industry

• Policy created a highly efficient agricultural system
Real food and agricultural research and development funding, 1970-2009

$ billion (2006 dollars)

Note: Data for 2008-09 are preliminary.
Source: USDA, ERS based on data from National Science Foundation, USDA's Current Research Information Systems (CRIS), and various private sector data sources. Data are adjusted for inflation using an index for agricultural research spending developed by ERS.
Acres of irrigated land, 2012

U.S. total = 55,822,231 acres

1 dot = 10,000 acres

Tree planting in the United States

Acres of Irrigated Land as Percent of Land in Farms Acreage: 2007

United States 6.1 Percent

07-M082
U.S. Department of Agriculture, National Agricultural Statistics Service
Cellulosic Ethanol

- Use enzymes to break down rigid cellulose structure into sugars
- Use microbial fermentation to convert sugars into ethanol
- Separate ethanol from byproducts (ie. lignin)
- Distillation to achieve 99.5% ethanol
14 Commercial and Pilot Scale Plants in US

- Cellulosic Ethanol Technologies, LLC, Galva, IA (2M gpy)
- Abengoa, Hugoton, KS (25M gpy)
- Poet-DSM, Emmetsburg, IA (25M gpy)
- Dupont, Nevada, IA (under construction, 25M gpy)
- 14¹ commercial and demonstration plants in US with capacity of 70M gpy
- Many other projects underway

¹Source: http://www.ethanolproducer.com/plants/listplants/US/Existing/Cellulosic
Timber land by region and stand age class, 1997

Graphic does not include 9 million hectares of uneven-aged timber land in the North.

Natural Capital Degradation: Areas of Greatest Aquifer Depletion in the U.S.

Groundwater Overdrafts:
- High
- Moderate
- Minor or none
Land is Already being Taken out of Production

Source: Lark et al. 2015

Source: National Report on Forest Resources